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appears that he used the very low temperature of 16°7 C. He finds that some seeds germinate much better in darkness than in light, for example, *Leucojum vernum*, Asphodelus, *Anthericus ramosus*, *Paris Smilacina*, Polygonatum, and Veratrum. Phacelia and *Nemophila insignis* germinate very slowly and sparingly in white light, more rapidly and abundantly in darkness, and very quickly and completely in blue light. KINZEL finds the favorable action of the light is not due to the actinic rays, for in many cases the rays exerting least actinic power are most effective in bringing about germination.—WILLIAM CROCKER.

Heterotypic mitosis in Lilium.—In a paper on the prophase of the heterotypic mitosis in the embryo sac mother cell, MOTTIER[33] describes the effect of fixing fluids and traces the early development of the heterotypic spirem in the megaspore mother cell of *Lilium Martagon* and *L. candidum*. The following conclusions are reached: (1) Previous to synapsis a single nuclear thread is developed, which in many cases can be demonstrated clearly as a definite spirem with somewhat regular and uniform chromatin granules. (2) There is no union side by side of two distinct chromatin spirems before or during synapsis, which is regarded as a normal process, but the greater compactness of the balled-up mass may be due partly to the reagent. (3) The hollow spirem following synapsis is double, due to the longitudinal fission, which as a rule becomes completely obscured before the transverse segmentation. (4) The first mitosis, therefore, separates transversely the two members of the bivalent chromosome. (5) The heterotypic mitosis is thus a reduction division, and if one chromosome differs from another potentially or otherwise, it is also qualitative. (6) In the presynaptic phase, that the chromatin may appear as large clumps instead of smaller and uniform granules has been suggested as being due in part to the fixing fluids, the finer and more uniform granules being nearer the normal. The wide divergence of the halves of the chromatin thread appearing occasionally in the stage of the hollow spirem may also be due in part to the reagent.—SHIGÉO YAMANOUCHI.

Germination of zygotes of Spirogyra.—The germination of zygotes of *Spirogyra jugalis* Ktzg. has been studied by KARSTEN.[34] The germinating stage of the zygotes was obtained during November and December, and some of the cytological results are as follows: Two nuclei in the zygote are in close contact, the membranes between them staining faintly and evidently becoming dissolved. In the fusion nucleus two nucleoli derived from two gamete nuclei are seen for a time, but they finally fuse. The interior of the fusion nucleolus is vacuolized, but the outer portion remains and stains deeply. At the first division of the nucleus the synaptic stage is represented by a peculiar and irregular massing of the nucleolar membrane and a peculiar elongated condition of the nucleolus, which is now directly surrounded by the cytoplasm. The nucleolus then gradually assumes a rounded form, in which are seen 14 deeply stained tetrads that differentiate later into 28 chromosomes. The chromosomes become united in pairs and 14 bivalent chromosomes are established. The spindle is at first multipolar, but gradually becomes bipolar. The daughter chromosomes grouped at the poles, after the first division, again take the form of nucleoli in the daughter nuclei. In the second division 14 chromosomes are clearly distinguishable in the polar view of the equatorial plate. Consequently in *Spirogyra jugalis* 14 is the haploid number of chromosomes and 28 the diploid number.—SHIGÉO YAMANOUCHI.

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[33] MOTTIER, DAVID M., On the prophases of the heterotypic mitosis in the embryo sac mother cell of Lilium. Annals of Botany **23**:343–353. *pl. 23*. 1909.

[34] KARSTEN, G., Die Entwicklung der Zygoten von *Spirogyra jugalis* Ktzg. Flora **99**:1–11. *pl. 1*. 1908.

Oxidizing enzymes.—EULER and BOLIN[35] have published a third paper on oxidizing enzymes. They have developed a method for the quantitative determination of peroxidase. They have also devised methods for the purification of the peroxidase of the horseradish, which gives a far superior product to that obtained by BACH and CHODAT. The most highly purified product showed 10.4 per cent of nitrogen and 2.5 per cent of ash. Contrary to the belief of many, the action of this substance cannot be attributed to the trivalent iron and chinons it contains, but it is a true enzyme. They believe the peroxidases of various plants are not identical.

The oxidase of *Rhus vernicifera* was purified and compared with the oxidase of Medicago, which they have already studied in great detail.[36] The latter they have shown to be a mixture of calcium salts of various oxy-acids and it is not destroyed by boiling in water. The former contains nitrogen and is very sensitive to heat. Contrary to the contention of many, they find that the action of Rhus oxydase cannot be attributed to the joint action of contained manganese and hydroxyl, for it is equally effective in slightly acid, neutral, and slightly basic solutions.

These investigators, through their excellent chemical training, are making valuable contributions in this important field of plant physiology.—WM. CROCKER.

The giant form of Primula sinensis.—GREGORY[37] has examined the giant form of *Primula sinensis*, thinking it might have the tetraploid number of chromosomes, as Miss LUTZ and the reviewer found to be the case in *Oenothera gigas*. A doubling, however, does not occur, the numbers being 12 and 24, as in the ordinary form of *Primula sinensis*. It should be said that this giant Primula differs from the ordinary form in practically no respect except the larger size of its organs, while in *O. gigas* many of the characters have been sharply modified from those of *O. Lamarckiana*. While GREGORY finds the number of the chromosomes unchanged, he believes that the chromosomes are larger in the giant form,

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[35] EULER, H., UND BOLIN, IVAN, Zur Kenntnis biologisch wichtiger Oxydationen. III. Zeit. Physiol. Chemie **61**:72–92. 1909.

[36] *Ibid.* **61**:1–15. 1909.

[37] GREGORY, R. P., Note on the histology of the giant and ordinary forms of *Primula sinensis*. Proc. Cambridge Phil. Soc. **15**^{3}:239–246. *pl. 10.* 1909.